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# EVALUATION OF COMMUNITY PARTICIPATION FOR THE DEVELOPMENT OF CULTURE-BASED FISHERIES IN VILLAGE RESERVOIRS OF SRI LANKA

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☐ *In this paper, an attempt is made to identify the socioeconomic characteristics of a community that influence the development and management of culture-based fisheries in village reservoirs of Sri Lanka. Socioeconomic data were collected from 46 agricultural farming communities associated with 47 village reservoirs in Sri Lanka. Principal component analysis indicated that scores of the first principal component were positively influenced by socioeconomic characteristics that are favorable for making collective decisions. These included leadership of the officers, age of the group, percentage of active members of the group, percentage of kinship of the group, percentage of common interest of the group, and percentage of participation of the group. The size of the group had a negative effect on the first principal component. The principal component scores of communities were positively related to willingness to pay ($P < 0.001$). The communities with socioeconomic characteristics favoring collective decision making were in favor of culture-based fisheries. Homogeneity of group characteristics facilitated successful development of culture-based fisheries.*

**Keywords** contingent valuation, culture-based fisheries, reservoirs, socioeconomic heterogeneity, willingness to pay

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## INTRODUCTION

Inland fisheries is increasingly recognized as an important means of food security, especially in low-income food deficit countries (Coates, 1995). The human dimension of inland fisheries as a nutritional source has also been growing in importance (Sipponen & Greboval, 2001). In Sri Lanka, the inland fishery consists primarily of 170,000 ha of reservoirs (Amarasinghe & Weerakoon, 2008). There are over 10,000 village reservoirs in Sri Lanka but most of them are less than 100 ha in surface area with a cumulative area of around 39,000 ha. These small village reservoirs are positioned within well-defined small watersheds and distributed across the dry zone of the country (Panabokke, 2001) to irrigate agricultural land (De Silva, 1988). These ancient reservoirs support the rural economy by irrigating paddy lands, for grazing grounds for cattle and water buffalo, animal husbandry, and for subsistence fisheries (Ulluwishewa, 1995). Being a communal resource, village reservoirs are managed by a village assembly with the right to utilize these fishery resources (Ulluwishewa, 1995). The farmers who occupied land irrigated from the reservoirs have a tradition of working in groups on various agriculture activities (Siriweera, 1994), and collective fishing has been under the control of the village irrigation leader (Ulluwishewa, 1995).

The property rights of village reservoirs are poorly established in Sri Lanka (Heaney & Stephen, 2001). Successful management of communal property resources (Pringle, 1985) must be based on consideration of human aspects such as individual motivation, characteristics of individuals, nature of institutional arrangements, interactions among users, the ability of users to create new arrangements, and the behaviour of regulatory authorities (Feeny et al., 1996).

Village reservoirs are considered to be suitable for culture-based fisheries (Mendis, 1977; De Silva, 1988, 2001). Culture-based fisheries refer to capture fisheries that are based on the release of hatchery-reared animals (FAO 1997). Chinese and Indian major carps are typically stocked when the reservoirs are full (during the inter-monsoonal rainy season in December–January) and harvested 7–9 months later when the water level recedes during the dry season.

Village reservoirs come under the jurisdiction of the Department of Agrarian Development of Sri Lanka and farm organizations have been established under the Agrarian Services Act No. 58 in 1979, No. 4 in 1991, and Agrarian Development Act No. 46 in 2000. The Act vests authority to the farm organization to work as a group in agricultural activities (including inland fisheries). Only a few village reservoirs have been utilized by individuals to develop culture-based fisheries while many others are utilized by small groups of farm organizations (De Silva et al., 2006).

Sustainability of the group depends on a number of social, economic, institutional, and technological factors that include: (1) small size of the user group; (2) closeness of users and the resources; (3) homogeneity among group members; (4) effective enforcement mechanisms; (5) past experience of the organization; (6) external support; and (7) strong leadership (Agarwal, 2001). Therefore it is important to investigate the factors that influence effective management of culture-based fisheries. In this paper, an attempt is made to investigate socioeconomic characteristics of agricultural communities in relation to the development of culture-based fisheries in village reservoirs of Sri Lanka, with a view to identifying socioeconomic criteria that are important for selecting reservoirs for culture-based fisheries development.

## MATERIALS AND METHODS

### Selection of Village Reservoirs

This study was carried out in five administrative districts (i.e., Anuradhapura, Kurunegala, Hambantota, Monaragala, and Ratnapura) (Fig. 1). These districts have high numbers of village reservoirs that represent different social and economic characteristics. Site selection procedures have been described in detail in Jayasinghe et al. (2005), Wijenayake et al. (2005) and Kularatne et al. (2008). Forty-seven village reservoirs were selected randomly for the analysis based on: (1) reservoir size (<20 ha); (2) water retention time (6 to 11 months); (3) accessibility; (4) available infrastructure; (5) market status, and (6) willingness to participate in culture-based fisheries. These reservoirs were located within 46 villages in 29 Divisional Secretariat Divisions.

### Socioeconomic Data Collection

Of the 47 reservoirs studied, only 32 had sufficient water for culture-based fisheries. Fish were harvested using a 5 mm mesh 62 m × 8.5 m seine net after 7 to 10 months (water level of reservoirs was 0.5 to 1.0 m). Data usable for detailed analyses were obtained from only 23 reservoirs.

Socioeconomic data were collected using sample surveys in selected farmer communities. The following three categories were developed based on the 2002/2003 culture cycle: (1) farmer communities of village reservoirs that were stocked and harvested successfully; (2) farmer communities of village reservoirs which were stocked but were not harvested successfully; and (3) farmer communities of village reservoirs which were neither stocked nor harvested.

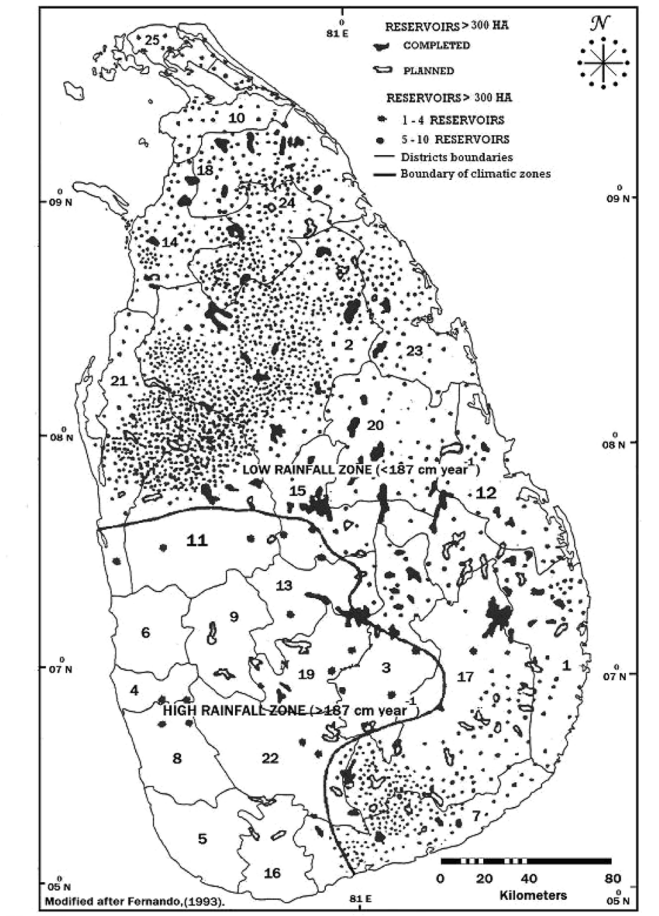


**FIGURE 1** Distribution of reservoir in different administrative districts of Sri Lanka.

Participatory rapid appraisal and rapid rural appraisal techniques (Townsley, 1993; Chambers, 1997, 1983) were used to collect primary data from individuals and community groups. Secondary information was extracted from previous research reports, village administrative officer reports, and resource profiles published by the Divisional Secretariat Divisions. In each of the 46 villages, a sample of households that used the reservoir was selected. Sample size was decided based on the accuracy and precision of the information collected as well as time allocation for the field survey, financial restrictions, and location of the reservoirs. At least 11% of

the households in each village were interviewed, resulting in from 10 to 126 households in each village.

Based on the population distribution, 4 to 22 individuals from each village were interviewed. In addition, group discussions were held in each village using participatory and rapid rural appraisals to assess the views of communities on culture-based fisheries. In most village reservoirs, culture-based fisheries activities are organized by farm organizations or aquaculture management committees appointed by farm organizations. An aquaculture management committee normally consists of around 10 members. A maximum of 22 households were selected from each village consisting of almost all of the members of the aquaculture management committees. The rest of the sample represented individuals from the same village who did not belong to an aquaculture management committee. Officials of the farm organizations and the aquaculture management committees were interviewed in groups. Interviewing was done by using two sets of structured, pre-tested questionnaires, one for the officials of farm organizations and aquaculture management committees and the other for the general membership. There were questions on characteristics of the resource system, community, institutions (formal and informal), markets, and government intervention in fish production.

## Data Analysis

Principal component analysis was used to reduce the observed variables into a smaller number of principal components that account for most of the variance in the observed variables. In principal component analysis, the number of components extracted is equal to the number of variables analyzed. The first component is expected to account for a fairly large amount of the total variance. Each succeeding component will account for progressively smaller amounts of variance. Although a large number of components may be extracted in this way, only the first few components will be important enough to be retained for interpretation. An Eigen value represents the amount of variance that is accounted for by a given component. In this analysis, we used the eigenvalue-one criterion, also known as the Kaiser criterion (Kaiser, 1960), in which the principal components with an eigenvalue greater than 1.00 are retained and interpreted.

Twenty-five socioeconomic characteristics (Table 1) were used to ordinate 46 communities through principal component analysis. Variables selected first for principal component ordination were Ln $(x+1)$ transformed and standardized to reduce non-normality of the data and to minimize variation in sampling units. Based on these 24 variables, 46 farmer communities were ordinated to extract principal components. The variables with greater influence on the first principal component were

**TABLE 1** List of Socioeconomic Variables Used in PCA

| |
|---|
| Group Size: Small number is favored for culture-based fisheries |
| Average education level of officers farm organizations and aquaculture marketing organizations |
| Average education level of group members |
| Average age of officers |
| Average years of service to the farm organization/aquaculture management committee of officers |
| Average years of experiences in fishery activity of the officers |
| Leadership of officers (Ranks: 1- very weak, 2- somewhat good, 3- good, 4- very good) |
| Average age of the group |
| Equality percentage of young members of the group |
| Equality percentage of active members of the group |
| Equality percentage of income of the group (highest percentage of low income) |
| Equality percentage of wealth of the group (highest percentage of low wealth) |
| Equality percentage of kinship of the group |
| Equality percentage of caste of the group |
| Equality percentage of migrant members of the group |
| Equality percentage of common interest of the group |
| Equality percentage of participation to the fishery activity of the group |
| Equality percentage of political party representation of the group. |
| Participation rate at the meetings |
| Average age of community (years) |
| Average family size of the community |
| Average number of income-generating activities of the households |
| Average number of unemployed members of households |
| Average dependency ratio of the households |
| Basic living condition of community (housing, water, sanitary, electricity, roads, transport, communication, getting information; Ranks: 1- weak, 2- good, 3- very good) |

then selected. For further clarification, bubble-scale plots of individual socioeconomic characteristics were superimposed on the principal component plots to identify characteristics with less variability and negligible gradients across the data set. The bubble plots were also examined to identify the variable pairs that were correlated with each other. From each of these inter-related variable pairs, one variable was disregarded. The variables chosen from the above analysis were used to ordinate farmer communities using principal components analysis. Ordination was performed using the Primer (version 5.2.2; Clarke & Gorley, 2001) software package. The relationship between scores of the first principal component and mean values of willingness-to-pay for culture-based fisheries of individual farmer communities was then determined. The mean principal component scores were compared using one-way ANOVA and the pair-wise comparisons between the groups were performed by Scheffe's test. These analyses were performed using SPSS (version 14.0.0) statistical software.

Willingness-to-pay was calculated for each community using a dichotomous-choice method (Gunathilaka, 2003). Each respondent received a hypothetical cost of stocking for one culture cycle and were then asked to state their willingness to pay to guarantee stocking of fish

**TABLE 2** Explanations for the Variables Used in the Regression

| Parameter | Variable | Description | Expected Sign |
|---|---|---|---|
| *WTP* | | *Willingness to pay for culture-based fisheries* | |
| $\beta_1$ | AHH | Age of household head | (15–65) |
| $\beta_2$ | EHH | Educational level of household head | (+) |
| $\beta_3$ | EAH | Number of economic activities of head of household | (−) |
| $\beta_4$ | UHH | Number of unemployed members of head of household | (+) |
| $\beta_5$ | YRV | Years of residence in the village | (+) |
| $\beta_6$ | INF | Availability of sources of information | (+) |
| $\beta_7$ | OL | Land ownership under the reservoir | (+) |
| $\beta_8$ | FOM | Membership of farmer organization | (+) |
| $\beta_9$ | AMC | Membership of aquaculture management committee | (+) |
| $\beta_{10}$ | LRA | Living in reservoir area | (−) |
| $\beta_{11}$ | CBF | Desire to engage in culture-based fisheries | (−) |
| $\beta_{12}$ | SIR | Socio-institutional risk | (−) |
| $\beta_{13}$ | NR | Natural risk in investment on culture-based fisheries | (−) |
| $\beta_{14}$ | MIN | Monthly income of households | (+) |
| $\beta_{15}$ | MFF | Member of a fisherman family | (+) |

fingerlings with a "Yes" or "No" answer. A multiple regression approach was used to identify socioeconomic factors that influenced willingness to pay. Step-wise multiple regression models were used for selection of the most important variables for willingness to pay for culture-based fisheries using SPSS (version 14.0.0) software. The regression model for willingness to pay (WTP) is as follows:

$$\mathrm{WTP} = \beta_{0+}\beta_1\,\mathrm{AHH} + \beta_2\,\mathrm{EHH} + \beta_3\,\mathrm{EAH} + \beta_4\,\mathrm{UHH} + \beta_5\,\mathrm{YRV} + \beta_6\,\mathrm{INF} + \beta_7\,\mathrm{OL} + \beta_8\,\mathrm{FOM} + \beta_9\,\mathrm{AMC} + \beta_{10}\,\mathrm{LRA} + \beta_{11}\,\mathrm{CBF} + \beta_{12}\,\mathrm{SIR} + \beta_{13}\,\mathrm{NR} + \beta_{14}\,\mathrm{MIN} + \beta_{15}\,\mathrm{MFF} + \mathrm{error}$$

The explanations for the variables used in the model are described in Table 2.

## RESULTS

Seven variables (education of officers of farm organizations, educational level, age of officers, age of community, family size, living conditions of households, and dependency ratio of households did not vary across communities (Fig. 2). Two variable pairs (income equality and wealth equality; caste and kinship) showed similar variability across communities (Fig. 3) so that one of the variables in each pair was disregarded. Sixteen variables were then used for principal components analysis. The first five principal components explained 67% of the cumulative variance (Table 3). The principal component score plot of the first two principal components is shown in Figure 4. The first principal component was positively influenced by socioeconomic characteristics that are favorable for making collective decisions (leadership of officers, age of the group,

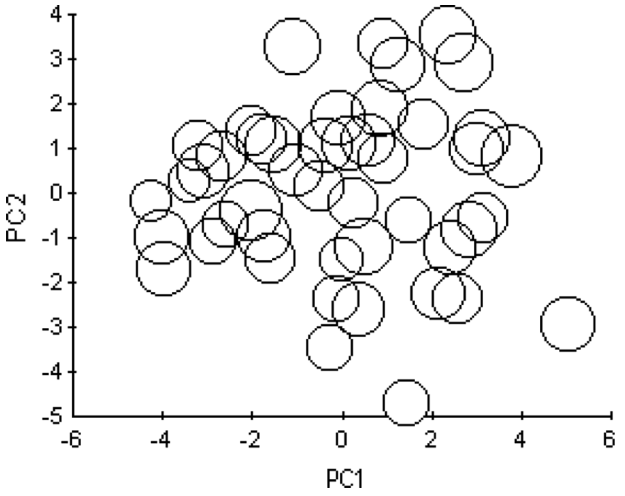


**FIGURE 2** Bubble scale plot of basic living conditions of the 46 rural communities indicating an example of a sociaoeconomic variable with insignificant variability across the communities.

percentage of active members of the group, percentage of kinship in the group, percentage of common interest of the group, percentage of group participation in the fishery, percentage of the same political party representation, and participation rate at the meetings) whereas group size had a negative influence (Table 3). In the second principal component axis, positive influence was due to the socioeconomic characteristics of percentage of income of the group, percentage of migrant members of the group, and number of unemployed members of households. Negative influences were the years of service of officers to the farm organization or aquaculture management committee and percentage of kinship of the group (Table 3). The first principal component scores were significantly different (one-way ANOVA; $F_{2,42} = 3.508$; $p < 0.05$; Table 4) and pair-wise comparisons (Scheffe's test) indicated that the mean value of the scores of the first principal component of communities that stocked and harvested successfully was significantly higher than for communities that neither stocked nor harvested successfully ($P < 0.05$; Fig. 5).

Results of the willingness to pay for culture-based fisheries development are given in Table 5. The farmer communities that stocked and harvested successfully recorded the highest percentage of members (80%) who were willing to contribute to the cost of culture-based fisheries. Fourteen percent of them were willing to pay the total cost. Nine communities that stocked but did not harvest had a similar attitude towards willingness to pay, but 77% of them were only willing to pay less than 25% of the total cost. The remaining 15 communities that did not stock or harvest cannot be compared directly with the other two groups because they were not

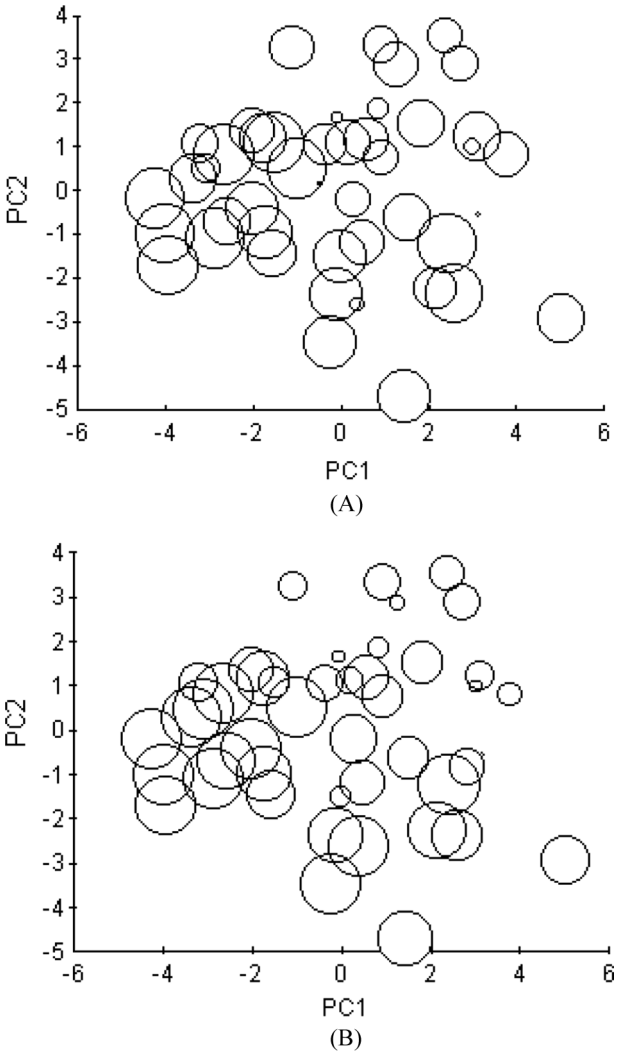


**FIGURE 3** Bubble scale plots of (A) Income equality and (B) Wealth equality of the 45 rural communities showing an example of a pair of variables with similar variability across the communities.

involved with culture-based fisheries activities. A lower percentage (70%) was willing to pay for culture-based fisheries, although 20% were willing to bear the total cost.

The principal component scores of communities which are characterized by the socioeconomic features of collective decision making are positively related to willingness to pay ($P < 0.001$; Fig. 6). Communities with socioeconomic characteristics favoring collective decision making were those that were favorable to culture-based fisheries activities.

**TABLE 3** Results of the Principal Component Analysis of 16 Socioeconomic Characteristics in the 46 Communities Studied

| | PC1 | PC2 | PC3 | PC4 | PC5 |
|---|---|---|---|---|---|
| Eigenvalue | 4.41 | 2.01 | 1.81 | 1.28 | 1.22 |
| % variance explained | 27.5 | 12.5 | 11.3 | 8.0 | 7.6 |
| % cumulative variance explained | 27.5 | 40.1 | 51.4 | 59.4 | 67.0 |
| Variables | | | | | |
| Group size | ***− 0.290*** | − 0.103 | 0.171 | 0.175 | − 0.427 |
| Years of service of officers | − 0.044 | ***− 0.464*** | 0.082 | 0.237 | 0.256 |
| Years of experiences of officers | 0.031 | 0.248 | 0.283 | − 0.380 | 0.466 |
| Leadership of officers | **0.317** | − 0.137 | − 0.192 | − 0.075 | − 0.077 |
| Age of the group | **0.309** | 0.050 | 0.215 | 0.345 | 0.171 |
| Percentage of young members of the group | 0.226 | − 0.012 | − 0.353 | − 0.085 | − 0.398 |
| Percentage of active members of the group | **0.290** | − 0.104 | − 0.317 | 0.355 | 0.057 |
| Percentage of income of the group | 0.135 | **0.308** | 0.438 | 0.342 | − 0.117 |
| Percentage of kinship of the group | **0.283** | ***− 0.340*** | 0.163 | 0.084 | 0.250 |
| Percentage of migrant members of the group | − 0.059 | **0.514** | − 0.077 | 0.123 | − 0.064 |
| Percentage of common interest of the group | **0.328** | 0.055 | 0.319 | − 0.104 | − 0.216 |
| Percentage of group participation for fishery | **0.366** | 0.174 | 0.145 | − 0.226 | − 0.175 |
| Percentage of same political party representation | **0.284** | − 0.016 | 0.129 | 0.282 | − 0.116 |
| Participation rate at the meetings | **0.361** | − 0.007 | − 0.195 | − 0.252 | − 0.060 |
| Income generating activities of households | 0.166 | 0.156 | − 0.219 | − 0.091 | 0.341 |
| Number of unemployed members of households | − 0.034 | **0.384** | − 0.356 | 0.398 | 0.215 |

In the first two principal components, most influential variable for principal component scores are indicated in bold (bold italics – negative influence; bold, non-italics – positive influence). For further explanations of variables, see Table 1.

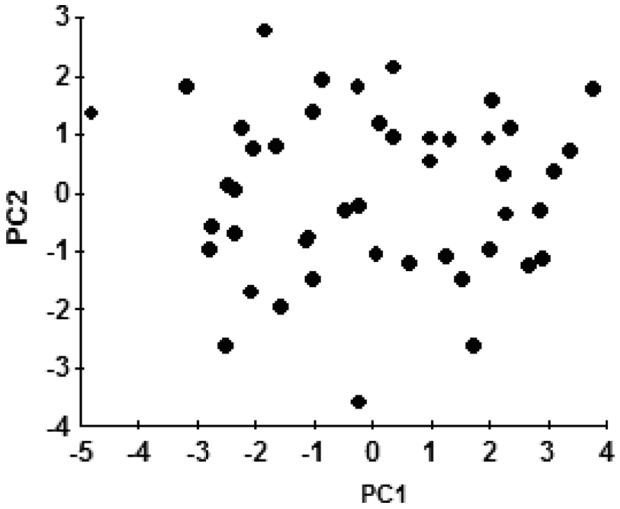


**FIGURE 4** The score plot of the first two principal components of 16 socioeconomic characteristics of communities 46 villages.

**TABLE 4** Results of One-way Analysis of Variance of First Principal Component Scores

| Source of Variation | Df | Sum of Squares | Mean Square | *F* | Probability Level |
|---|---|---|---|---|---|
| Between groups | 2 | 28.395 | 14.197 | 3.508 | 0.039 |
| Within groups | 42 | 169.983 | 4.047 | | |
| Total | 44 | 198.388 | | | |

Multiple regression models are given in Table 6. Education level of the farmer and monthly income positively influenced willingness to pay in the communities that successfully stocked and harvested village reservoirs. However living in the reservoir area and desire to engage in culture-based fisheries activities had negatively influenced on willingness to pay.

In communities with reservoirs that were stocked but not harvested successfully, the risk of investing in culture-based fisheries was found to be a negative relationship with willingness to pay. All other variables had positive influences on willingness to pay (Table 6).

Farmers that did not stock and harvest fish reservoirs had not engaged in culture-based fisheries during the study period due to various social, institutional, political and religious and cultural issues. The educated members of this farming group believed that they or their unemployed family members should not get involved in culture-based fisheries. The present analysis also showed negative responses of the educational level of farmers and the number of unemployed members in the family on willingness to pay for farmers who had not been involved with stocking and harvesting fish (Table 6). Families in the communities with longer periods of

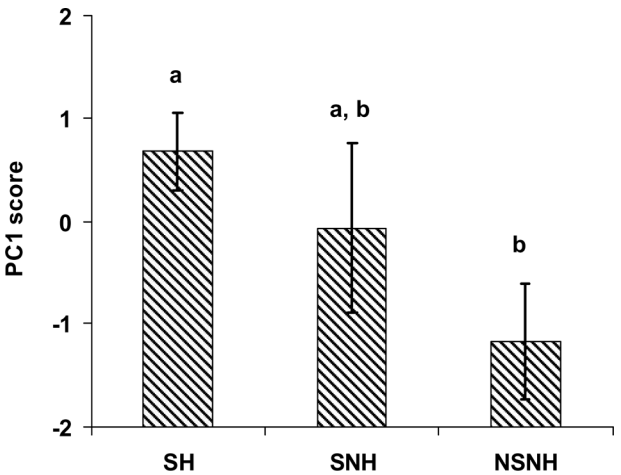


**FIGURE 5** Mean values of first principal component scores (±SE) based on the 16 socioeconomic characteristics of communities in three categories of reservoirs. The columns with similar letters are not significant at 5% probability level (Scheffe's test).

**TABLE 5** Percentage of Farmers Interviewed in the Three Categories of Communities Who Expressed Willingness to Pay for Culture-based Fisheries in Village Reservoirs and Percentages of Those Who Said "yes" for Five Levels of Contribution

| Level of Contribution | Stocked and Harvested | Stocked but did not harvest | Did not Stock nor Harvest |
|---|---|---|---|
| n | 347 | 130 | 178 |
| Said "Yes" (%) | 80 | 78 | 70 |
| $<25\%$ | 52 | 77 | 69 |
| 25% | 25 | 10 | 5 |
| 50% | 8 | 5 | 5 |
| 75% | 1 | 0 | 1 |
| 100% | 14 | 8 | 20 |

residence in the village were willing to get involved in culture-based fisheries, as shown by positive influences on willingness to pay, due to their attitude towards ownership of village reservoirs.

Negative influences of membership on aquaculture management committees and socio-institutional risk on the willingness to pay are evident 255
for the lack of success of community-based fisheries in these reservoirs. Crop cultivation in paddy fields is an individual activity of farmers who have their own plot of paddy land. On the other hand, culture-based fisheries activities are performed as group activities and as such, the absence of

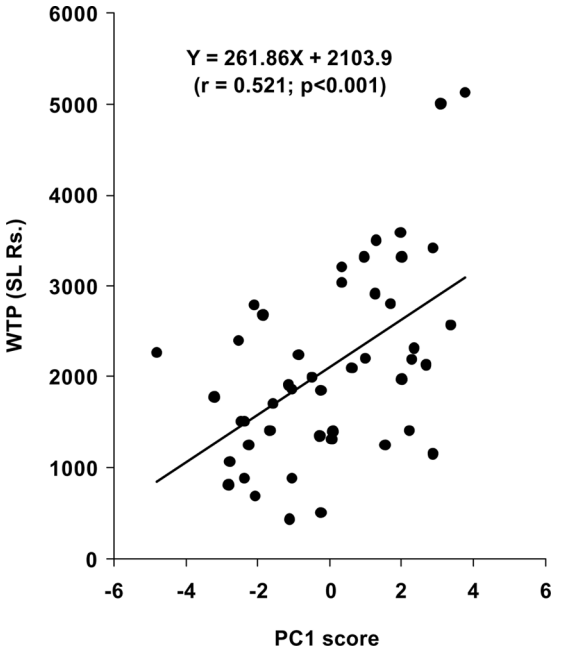


**FIGURE 6** Relationship between first principal component scores and willingness to pay for culture-based fisheries.

**TABLE 6** Factors Influencing Willingness to Pay for Culture-based Fisheries, as Determined by Step-wise Multiple Regression Analysis in Three Categories of Reservoirs

| Reservoirs | Variables | Coefficients | P-value |
|---|---|---|---|
| Stocked and harvested successfully | Constant | 0.422 | 0.028 |
| | Education level of household head | 0.010 | 0.054 |
| | Living in reservoir area | −0.099 | 0.014 |
| | Desire to engage in culture-based fisheries | −0.497 | 0.000 |
| | Monthly income of households | 0.063 | 0.005 |
| | $R^2 = 0.366$, $P = 0.000$ | | |
| | $N = 347$ | | |
| | Average willingness to pay (LKR) = 2354 | | |
| Stocked but not harvested | Constant | −0.619 | 0.058 |
| | No. economic activities of heads of households | 0.055 | 0.040 |
| | Availability of sources of information | 0.188 | 0.006 |
| | Membership, aquaculture management committee | 0.185 | 0.003 |
| | Desire to engage in culture-based fisheries | 0.282 | 0.000 |
| | Risk in investment on culture-based fisheries | −0.190 | 0.010 |
| | Monthly income of households | 0.114 | 0.005 |
| | $R^2 = 0.391$, $P = 0.000$ | | |
| | $N = 130$ | | |
| | Average willingness to pay (LKR) = 1750.00 | | |
| Not stocked or harvested | Constant | −0.289 | 0.068 |
| | Education level of household head | −0.023 | 0.019 |
| | No. of unemployed heads of households | −0.043 | 0.010 |
| | Years of residence in the village | 0.004 | 0.056 |
| | Membership, aquaculture management committee | −0.201 | 0.000 |
| | Desire to engage in culture-based fisheries | 0.370 | 0.000 |
| | Socio-institutional risk | −0.111 | 0.051 |
| | Monthly income of households | 0.093 | 0.000 |
| | Member of a fisher family | 0.500 | 0.000 |
| | $R^2 = 0.547$, $P = 0.000$ | | |
| | $N = 178$ | | |
| | Average willingness to pay (LKR) = 1657.30 | | |

group sustainability is a high social and institutional risk on culture-based fisheries. High monthly income of the farming family was found to be a positive factor affecting willingness to pay possibly due to their sound economic status. Obviously members of fisher families have positive influences on willingness to pay (Table 6).

## DISCUSSION

Village reservoirs of Sri Lanka are multiple use resources with irrigation as a major use. Other village activities are organized around the reservoir. Historically, village reservoirs belong to the state or to the temple, but some may be owned privately (Seneviratne, 1989). Village reservoirs can be

considered a communal property because only the families living within the village have the right to utilize resources in a village reservoir (Mills, 1933; Ulluwishewa, 1995).

Poor people are more dependent on village reservoirs for various livelihood needs and contribute more to the management and conservation of those reservoirs through collective actions, which would increase their productivity and income (Balasubramanian & Selvaraj, 2003).

The present study revealed that the socioeconomic characteristics that pertain to collective decisions, such as small group size, leadership qualities of officers, kinship of the community, participation rate in fisheries activities and participation rate of regular meetings have a positive influence on willingness to pay for culture-based fisheries activities in village reservoirs. The extent of arable land represents the number of active farmers associated with each reservoir. According to the Agrarian Development Act of 2000 (Anon, 2000), there should be at least 25 members in a farmer organization (FO). Culture-based fisheries activities were organized by aquaculture management committees in 53% of selected communities. Group sizes of aquaculture management committees varied from 5 to 15. Individual economic benefits are higher when the group size is smaller than in aquaculture management committees with large group sizes.

Larger groups are less likely to contribute to collective action than smaller ones (Oliver, 1988). Higher percentages of participatory behavior depended on the group size, and the size of the user group had a negative impact on cooperation (Balasubramanian & Selvaraj, 2003). All farmers who own agricultural land under the reservoir are expected to be present at meetings in which decisions related to culture-based fisheries are made. Since land ownership is through inheritance, the majority of decision-making at the meeting is supported by kinship patterns.

The present analysis indicated that communities with socioeconomic characteristics favoring collective decision-making have positive influences on willingness to pay for culture-based fisheries activities. This suggests that willingness to pay can be effectively used as a socioeconomic indicator for selecting rural communities for the development of culture-based fisheries in village reservoirs.

Educational levels of the farmers who were involved in successful culture-based fisheries was a significant variable which positively influenced willingness to pay. Skills in book-keeping, establishing links with administration, marketing and conflict resolution in culture-based fisheries are key areas in which knowledgeable members can get involved in efficient culture-based fisheries activities.

Rural farmers are known to be potentially involved in multiple farm and non farm activities (Taylor & Yunez Naude, 2000). Between the two labor intensive peak cultivation seasons, farmers have sufficient time to be

mobilized in other economic activities (De Alwis, 1983; Murray et al., 2001). Rain-fed agriculture in low rainfall regions of Sri Lanka is of high risk and uncertainty (Tennakoon, 1986). Low rainfall at the beginning of the crop year and high rainfall in the harvest period affect agricultural production. Low rainfall does not favor culture-based fisheries activities in the reservoirs due to insufficient water and high rainfall in the harvesting period may result in overflow from the reservoir that facilitates escape of stocked fish.

Due to the uncertainty in rain-fed agriculture, rural farmers are compelled to get involved in many economic activities. Involvement of a household in many economic activities is an indication of the absence of a fixed income source. The positive influence of the number of economic activities of the household on willingness to pay by farmers who had successfully stocked and harvested reservoirs could possibly be due to the absence of a fixed income source. However farmers who had not stocked or harvested reservoirs successfully were of the opinion that unemployed members should not get involved in culture-based fisheries. This may be due to the fact that fishery-related activities are still not socially acceptable especially among older members in some rural communities. Rearing-and-killing fish is not acceptable in the Buddhist religious philosophy, which is the major religion in rural parts of the country.

School age children do not like to join culture-based fisheries activities as a member of an aquaculture management committee due to social discrimination associated with fish culture. Farmers in the 40–45 years age group were positively associated with culture-based fisheries. In practice, it is necessary for people living around the reservoir to be involved in culture-based fisheries. Nevertheless, when there are many people living around the reservoir, all of them may wish to become members of the aquaculture management committee resulting in large group sizes. As shown by the present analysis, such large group sizes negatively influence culture-based fisheries.

In conclusion, the present study indicated that in addition to the biological and ecological characteristics of village reservoirs as described by Jayasinghe et al. (2005) and Wijenayake et al. (2005), socioeconomic heterogeneity in communities and their potential contribution to culture-based fisheries that can be quantified using contingent evaluation techniques (Wattage & Mardle 2005). Although willingness to pay is usually used to value un-priced environmental goods, these approaches can be used to select communities and reservoirs for development of culture-based fisheries.

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